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Assessing Explosives Safety Risks, Deviations, And Consequences

Department of Defense Explosives Safety Board

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FOREWORD

Technical Paper (TP) 23 provides Department of Defense Explosives Safety Board (DDESB) guidance to the Explosives Safety Risk Management (ESRM) Program. This TP describes the DDESB ESRM Program outlined in DoDI 6055.16, Explosives Safety Management Program (ESMP), July 29, 2008. It also presents a course of action and a tool to standardize the deviation process and information provided for explosives risk decisions.

This document will be kept current and will be updated as new information becomes available. The latest version of the document can be found on the DDESB Website at: http://www.ddesb.pentagon.mil

This Technical Paper has been reviewed by the DDESB Risk Based Explosives Safety Criteria Team and the DDESB Staff.

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CHAPTER 1

INTRODUCTION

1.1. Background

1.1.1. To better serve the warfighter, the Department of Defense Explosives Safety Board (DDESB) is continually transforming, seeking continuous improvement, and operationalizing the DoD's ESMP. This includes the development of new ESMP-related tools and approaches to assist warfighters in executing their mission, conserving resources, and maximizing operational effectiveness. When mission risk is reviewed and managed correctly, Department of Defense (DoD) Components can safely and aggressively execute their missions.

1.1.2. This TP:

1.1.2.1. Describes the DDESB Explosives Safety Risk Management (ESRM) Program outlined in DoD Instruction (DoDI) 6055.16 (Reference (a)).

1.1.2.2. Presents a course of action and a tool to standardize the deviation process and information provided for explosives risk decisions.

1.1.2.3. Provides decision-makers associated with DoD munitions assets worldwide with a more understandable and consolidated information package for their review, with the overall goal to reduce and manage residual risk.

1.2. Objectives. It is DoD policy to:

1.2.1. Provide the maximum possible protection to people and property from the damaging effects of DoD military munitions in accordance with DoD Directive (DoDD) 6055.9E (Reference (b)).

1.2.2. Make informed risk decisions at the appropriate level of leadership in accordance with Reference (b) and DoDD 4715.1E (Reference (c)).

1.2.3. Implement management system approaches and best business practices to maintain ESMPs in accordance with Reference (c).

1.2.4. Provide standardized information for determining and assessing explosives safety risk in accordance with DoD 6055.9-STD (Reference (d).

CHAPTER 2

RISK MANAGEMENT MODEL

> "Often, a risk assessment is conducted to help determine whether to reduce risk and, if so, to establish the appropriate level of stringency. A wide set of standards derived from statutes, regulations, and/or case law guide regulatory agencies in making risk management decisions. In such situations, the risk management standard is known a priori [sic] based on "acceptable risk" considerations." (Reference (e))

2.1. Office of Management and Budget (OMB) Principles of Risk Management

2.1.1. In 1995, the OMB prepared a memorandum titled, "Principles of Risk Management" (Reference (f)). It stated that "the principles are aspirational rather than prescriptive. Their application requires flexibility and practical judgment. The science of risk assessment is rapidly changing and its use is a function of a number of factors—including legal mandates and available resources—that vary from one regulatory program to another. We therefore do not offer these principles as conclusive, complete or irrevocable; they are intended to be used as a point of departure for future efforts within individual agencies and the Executive Branch broadly."

2.1.2. OMB reissued the information in a September 2007 memorandum titled, "Updated Principles for Risk Analysis" (Reference (g)). The general principles outlined by OMB, (see Figures 2.1 and 2.2), for risk assessment apply to this TP. The OMB 2007 memorandum stated that a risk assessment is a useful tool for estimating the likelihood and severity of risks to human health, safety, and the environment, and for informing decision-makers how to manage those risks. Risk assessment is most useful when those who rely on it to perform the risk management process understand its value, nature, and limitations, and use it accordingly.

General Principles*

1. These Principles are intended to be goals for agency activities with respect to the assessment, management, and communication of environmental, health, and safety risks. Agencies should recognize that risk analysis is a tool—one of many, but nonetheless an important tool—in the regulatory tool kit. These Principles are intended to provide a general policy framework for evaluating and reducing risk, while recognizing that risk analysis is an evolving process and agencies must retain sufficient flexibility to incorporate scientific advances.

2. The Principles in this document are intended to be applied and interpreted in the context of statutory policies and requirements, and Administration priorities.

3. As stated in Executive Order No. 12866, " In setting regulatory priorities, each agency shall consider, to the extent reasonable, the degree and nature of the risks posed by various substances or activities within its jurisdiction" [Section 1(b)(4)]. Further, in developing regulations, federal agencies should consider "…how the action will reduce risks to public health, safety, or the environment, as well as how the magnitude of the risk addressed by the action relates to other risks within the jurisdiction of the agency" [Section 4(c)(1)(D)].

4. In undertaking risk analyses, agencies should establish and maintain a clear distinction between the identification, quantification, and characterization of risks, and the selection of methods or mechanisms for managing risks. Such a distinction, however, does not mean separation. Risk management policies may induce changes in human behaviors that can alter risks (i.e., reduce, increase, or change their character), and these linkages must be incorporated into evaluations of the effectiveness of such policies.

5. The depth or extent of the analysis of the risks, benefits and costs associated with a decision should be commensurate with the nature and significance of the decision.

*Source: Reference (g).

Figure 2.1. OMB General Principles

Principles for Risk Assessment*

1. Agencies should employ the best reasonably obtainable scientific information to assess risks to health, safety, and the environment.

2. Characterizations of risks and of changes in the nature or magnitude of risks should be both qualitative and quantitative, consistent with available data. The characterizations should be broad enough to inform the range of policies to reduce risks.

3. Judgments used in developing a risk assessment, such as assumptions, defaults, and uncertainties, should be stated explicitly. The rationale for these judgments and their influence on the risk assessment should be articulated.

4. Risk assessments should encompass all appropriate hazards (e.g., acute and chronic risks, including cancer and non-cancer risks, to human health and the environment). In addition to considering the full population at risk, attention should be directed to subpopulations that may be particularly susceptible to such risks and/or may be more highly exposed.

5. Peer review of risk assessments can ensure that the highest professional standards are maintained. Therefore, agencies should develop policies to maximize its use.

6. Agencies should strive to adopt consistent approaches to evaluating the risks posed by hazardous agents or events.

*Source: Reference (g).

Figure 2.2. OMB Principles for Risk Assessment

2.1.3. The DDESB ESRM model and the DoD Components' risk management processes incorporate all of OMB's principles. Table 2.1 presents a comparison summary of the DoD and Services' risk management processes. These processes are described individually in paragraphs 2.2 through 2.5.

Table 2.1. Risk Management Process Comparison

DoD ESRM Process	Army's Composite Risk Management	Navy and Marine Corps Operational Risk Management (ORM) Process	Air Force ORM Process
Identify hazards.	Identify hazards.	Identify hazards.	Identify the hazards.
Assess risks.	Assess hazards to determine risk.	Assess hazards.	Assess the risks.
Develop risk control options.	Develop possible countermeasures and make risk decisions.	___	Analyze risk control measures.
Make risk decisions.	___	Make risk decisions.	Make control decisions.
Implement selected options.	Implement controls.	Implement controls (both engineering and administrative).	Implement risk controls.
Monitor and evaluate mitigation controls.	Supervise and evaluate.	Supervise.	Supervise and review.

2.2. DoD ESRM Process

2.2.1. The DoD ESRM model consists of six separate steps:

2.2.1.1. Identify hazards.

2.2.1.2. Assess risks.

2.2.1.3. Develop risk control options.

2.2.1.4. Make risk decisions.

2.2.1.5. Implement selected options.

2.2.1.6. Monitor and evaluate mitigation controls.

2.2.2. The ESRM model (Figure 2.3) outlines the steps necessary to evaluate hazards that fall outside the criteria of Reference (d). By following these steps, DoD personnel will be better able to make informed explosives safety risk decisions. They will also be better able to provide stakeholders information about the risk and level of risk being accepted. A detailed discussion of the steps is presented in Chapter 3.

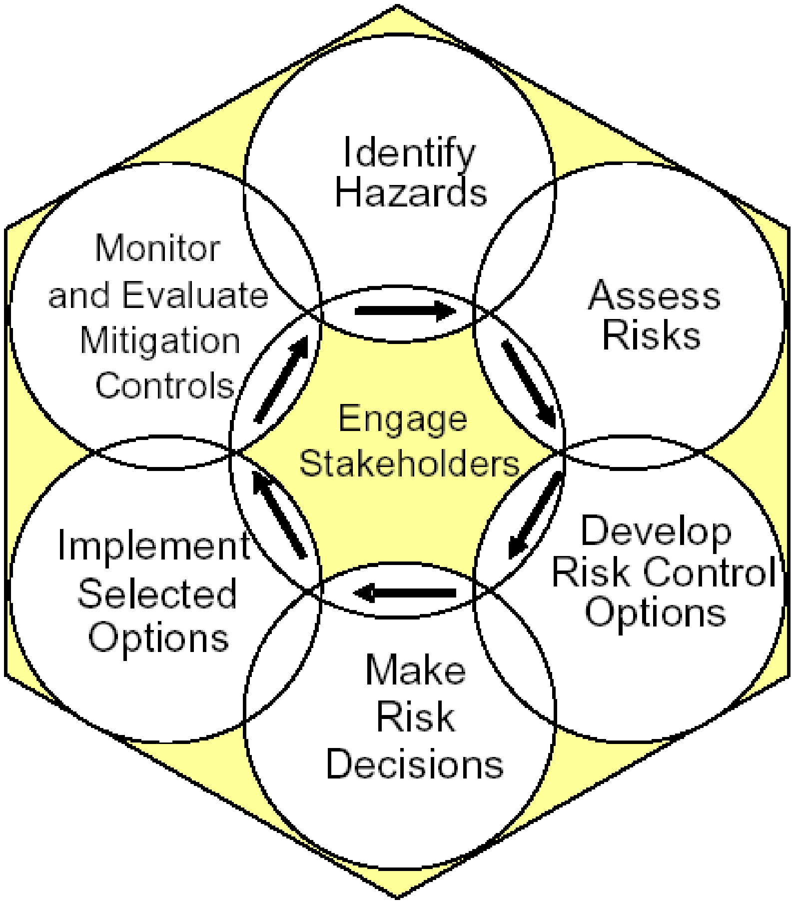

Figure 2.3. ESRM Model

2.3. Army Composite Risk Management (CRM) Process

2.3.1. The Army CRM process is outlined in Field Manual (FM) 5-19 (Reference (h)). CRM is the Army's primary decision-making process for identifying hazards and controlling risks across the full spectrum of Army missions, functions, operations, and activities. It combines both tactical and accidental risks.

2.3.2. Department of the Army Pamphlet (DA PAM) 385-30 (Reference (i)) introduces the mishap risk management (MRM) process, part of the CRM process. It permits leaders to make informed, conscious decisions to accept risk involving safety and occupational health factors, including explosives safety risks. MRM applies to Soldiers, on and off duty, and to the total life cycle of missions, systems, operations, equipment, and facilities from conception to completion or disposal.

2.3.3. The Army MRM process consists of five steps:

2.3.3.1. Identify hazards.

2.3.3.2. Assess hazards to determine risk.

2.3.3.3. Develop possible countermeasures and make risk decisions.

2.3.3.4. Implement controls.

2.3.3.5. Supervise and evaluate.

2.3.4. Reference (i) provides details and examples for each step of the MRM process. It also provides a matrix that uses Hazard Severity and Mishap Probability to determine an overall risk assessment code (RAC). There are five levels of RACs ranging from low to extremely high. The RAC is used to assist personnel in determining hazard abatement priorities.

2.3.5. When risks cannot be corrected, MRM provides a matrix that introduces risk duration to determine the appropriate organization to accept the risk.

2.4. Navy and Marine Corps ORM Process

2.4.1. The Navy ORM process is outlined in Chief of Naval Operations Instruction 3500.39B (Reference (j)); the Marine Corps process is outlined in Marine Corps Order 3500.27B (Reference (k)). These documents are decision-making tools that increase the ability of Navy and Marine Corps leaders to make informed risk decisions and, consequently, are applicable to all activities, commands, and personnel.

2.4.2. The Navy and Marine Corps ORM process consists of five steps:

2.4.2.1. Identify hazards.

2.4.2.2. Assess hazards.

2.4.2.3. Make risk decisions.

2.4.2.4. Implement controls (both engineering and administrative).

2.4.2.5. Supervise.

2.4.3. There are three levels in the ORM process—time-critical, deliberate, and in-depth—each of which determines the level of intensity and complexity of the risk assessment. They range from performing the five-step ORM process mentally or orally without recording the information to performing a very deliberate process that involves a thorough written risk

assessment. In all cases, the information is elevated to a command or managerial level comparable to the risk level for the operation at hand.

2.4.4. Reference (j) provides an example risk matrix used in naval occupational safety and health assessments. This matrix:

2.4.4.1. Uses hazard severity and mishap probability to determine an overall RAC, ranging from negligible to critical. The RAC assists personnel in determining hazard abatement priorities.

2.4.4.2. Provides an ORM flow chart to assist in identifying and following the five-step ORM process.

2.4.5. When explosives safety-related risks cannot be corrected, the documentation is forwarded to the Chief of Naval Operations for acceptance. This procedure is followed for all explosives safety risk levels, with the exception of those pertaining to event waivers. Event waivers are accepted at all levels of Command depending on the risk level associated with the particular incident.

2.5. Air Force ORM Process

2.5.1. The Air Force ORM process is outlined in Air Force Pamphlet 90-902 (Reference (l)). The objective of this document is to protect personnel and conserve combat weapon systems, thus maximizing combat capability. It applies to all individuals (leaders, airmen, and civilians) throughout the Air Force.

2.5.2. The Air Force ORM process consists of six steps:

2.5.2.1. Identify the hazards.

2.5.2.2. Assess the risks.

2.5.2.3. Analyze risk control measures.

2.5.2.4. Make control decisions.

2.5.2.5. Implement risk controls.

2.5.2.6. Supervise and review.

2.5.3. There are three levels in the ORM process—time-critical, deliberate, and strategic—each of which determines the level of intensity and complexity of the risk assessment. They range from performing the six-step ORM process mentally or orally without recording the information to one that involves a thorough written risk assessment. In all cases, the information

is elevated to a command or managerial level comparable to the risk level for the operation at hand.

2.5.4. Reference (l) provides details and examples for each step of the ORM process. It also provides a matrix that uses hazard severity and mishap probability to determine a priority order of preference. This order of preference is used to assist personnel in determining hazard abatement priorities.

2.5.5. Air Force Manual 91-201 (Reference (m)) provides a nomograph that introduces exposure levels into the explosives acceptance ORM process. Using the three data points (severity, probability, and exposure) necessary for this nomograph, the user can determine the acceptance level for the risk.

CHAPTER 3

DDESB ESRM PROCESS

3.1. General

3.1.1. The DDESB ESRM process is outlined in Reference (a); risk stewardship is specifically outlined in Enclosure 4, DoD Military Munitions, Explosives and Chemical Agent Risk Stewardship. ESRM, which applies to all DoD organizations and personnel, employs the model shown in Figure 2.3 of this paper.

3.1.2. The goal of ESRM is to increase, from an explosives safety perspective, DoD knowledge of explosives and chemical agent safety risks to aid in the decision-making process. It is the cornerstone of explosives safety management (ESM) and provides:

3.1.2.1. A means to support DoD Components in reducing costs and eliminating unnecessary expenditures.

3.1.2.2. Tools for making informed ESRM decisions to leaders and managers who are responsible for implementing an effective ESMP.

3.1.3. Reference (a) provides the ESRM requirements for DoD organizations. In particular, it requires DoD Components to develop, publish, and implement DoD Component ESMP policy and guidance for explosives safety risk management. Further, the DoD Components are required to issue policy and procedures for explosives risk acceptance. This TP is intended to assist DoD Components in meeting these requirements.

3.1.4. The DoD ESRM process, introduced in paragraph 2.2, can be divided into two separate and distinct areas: technical risk area (TRA) and managerial (leadership) risk area (MRA). As shown in Figure 3.1, the dynamic ESRM process involves two continuous, overlapping, simultaneous functions for identifying and evaluating hazards, particularly explosives and chemical agent safety hazards, and managing risks associated with military munitions.

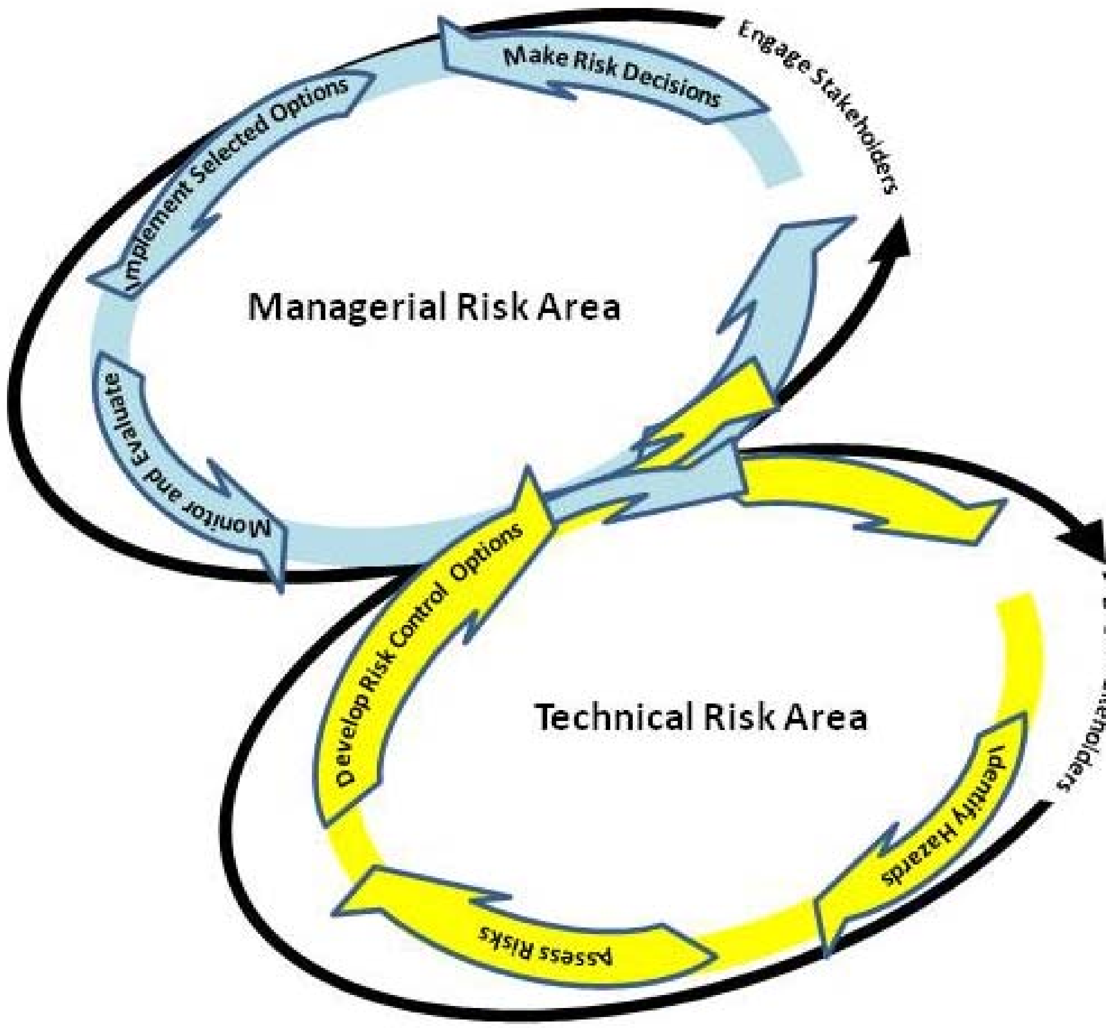

Figure 3.1: DDESB Dynamic ESRM Model

3.1.5. This TP focuses primarily on the TRA, where analysts identify hazards, assess risks, and develop control measures that would mitigate these hazards and risks. This process is cyclic because control measures will change the process and the hazards and risks. These risks must be reevaluated to determine if the control measures are adequate or need improvement, thus returning to the first step of the ESRM process, identify hazards. This can and should be done without leadership input; however leadership must be informed of all hazard and risk mitigations in order to make the most informed decisions.

3.1.6. When the analyst finishes developing control measures, the information flows into the MRA. This is when leadership controls the process. Decisions are made and risk management options are selected, which are then monitored and the new hazard and risk enter the TRA for reevaluation.

3.2. TRA Steps

3.2.1. Step 1: Identify Hazards

3.2.1.1. The first step of the TRA is to identify the potential explosives and chemical agent hazards associated with each mission. Analysts should execute this part of the TRA in coordination with personnel familiar with the operation (e.g., workers, supervisors).

3.2.1.2. In order to find a hazard, a common definition is required. A hazard is a condition, situation, or event with the potential to cause injury, illness, or death of personnel; damage to or loss of equipment, property, or environment; or mission degradation, failure, or loss. Hazards can exist in all environments—combat operations, stability operations, base support operations, manufacturing, training, garrison activities, and off-duty activities.

3.2.1.3. A systematic hazard identification process must be used. This may include examining and using historical hazard and mishap data and lessons learned from other missions. Formal hazard analyses, fault tree analysis, failure modes effects analysis, and so on, may also be used for identifying hazards. This step should be started as early in the mission process cycle as possible to gain maximum benefits. Prior to proceeding, the analyst should obtain the answers to the "who, what, when, where, why, and how" pertaining to any potential hazards. To further expand the analysis, these questions may also be asked:

3.2.1.3.1. Who are the people adversely affected by the hazard?

3.2.1.3.2. What is the hazard?

3.2.1.3.3. Where did the hazard arise?

3.2.1.3.4. When did the hazard first arise?

3.2.1.3.5. Why is it a hazard?

3.2.1.3.6. How might the long- and short-term effects be experienced?

3.2.1.4. All noncompliant hazards must be addressed and evaluated on an individual basis first, such as explosives safety quantity-distance (ESQD), lightning protection, and vegetation control. These must then be looked at from a broader standpoint to see if there are any grouped hazards, such as not meeting intermagazine distance (IMD). As with an IMD violation, the quantities of the noncompliant locations must be added together and a new hazard must be examined. The tool described in Chapter 5 can be used only with a noncompliant ESQD hazard.

3.2.2. Step 2: Assess Risks

3.2.2.1. The second step of the TRA is to assess the risks associated with the hazards found in step 1. Risks have two parts associated with them, probability and severity, and can be evaluated either qualitatively or quantitatively.

3.2.2.2. The probability portion of risk assessment entails determining the likelihood of the hazard occurring. This is where the experience of the group gathered in the identification part of the TRA is important as it can be based on their estimate from experience and knowledge of the mission or operation taking place. Terms typically used to describe risk probability are frequent, highly likely, likely, occasional, not likely, seldom, and unlikely.

3.2.2.3. The severity portion of risk assessment entails determining the negative impact on personnel, facilities, equipment, operations, the public, and the environment. Many of the questions asked in the identification stage will assist in determining the severity of the risks, and the DoD Component must determine how the risk severity will be classified. Terms typically used for risk severity are catastrophic, critical, marginal, unacceptable, minor, and negligible.

3.2.2.4. Severity and probability are combined for each hazard to form a risk assessment. Many organizations, including the military Services, use a matrix that combines severity and probability to further categorize the level of the risk as high, medium, or low. The risk assessment assists leadership in the MRA portion of the dynamic model. If the risk is to be accepted, the risk assessment will also inform leadership in the MRA portion as to who is authorized to accept this risk. It is also the responsibility of the DoD Component to determine at what levels risk will be accepted.

3.2.2.5. If the hazard identified pertains to ESQD risks, the tool described in Chapter 5 will assist in the risk assessment process.

3.2.3. Step 3: Develop Risk Control Options

3.2.3.1. The third step of the TRA is to develop control options for the risks assessed in the step 2. After assessing the risks, the analyst must develop risk control options. These controls will either eliminate or reduce the risk by a combination of eliminating or reducing the hazard and/or reducing the probability of the event. Controls can include things such as elimination through an engineering change or a change in a procedure or use of personal protective equipment. The Safety Order of Precedence should be followed when determining control measures. In order for the control to be effective, it must reduce or eliminate the hazard. From most preferred to least preferred, the Safety Order of Precedence for mitigating hazards by design safety is:

3.2.3.1.1. Use alternative design methods.

3.2.3.1.2. Use safety devices.

3.2.3.1.3. Use warning devices.

3.2.3.1.4. Provide safety training or procedures.

3.2.3.2. Effective control measures must answer the same questions asked when identifying the hazard: who, what, where, when, why, and how. In order to answer these questions, the analyst should obtain input from personnel responsible for performing the mission. Personal experience, accident reports, standing operating procedures, lessons learned, and regulations are just some of the area control measures that can be found.

3.2.3.3. The residual risk and hazard (what remains after the controls are introduced) must be reevaluated to ensure no new hazards are introduced and the overall risk levels are reduced. This can only be done by using the circulative method shown in Figure 3.1. During this reevaluation, the hazard, risk, and control measure information can be put in the MRA section of the model. Leadership can begin the process outlined in paragraph 3.3 below at the same time the residual hazard and risks are evaluated in the TRA section.

3.3. MRA Steps

3.3.1. Step 1: Make Risk Decisions

3.3.1.1. The first step of the MRA is to make risk decisions. This is the first time leadership is involved in the process. One of the main points of a risk decision is risk mitigation planning. Risk mitigation planning is the process that answers the same important questions raised throughout the ESRM process: who, what, where, when, why, and how. Risk mitigation is intended to enable program success and identifies, evaluates, and selects options to set risks at acceptable levels given the constraints and objectives of the program.

3.3.1.2. A key factor in risk decisions is to determine what constitutes an acceptable level of risk. Risk must be balanced against expected gains and losses. These decisions must always be made at the appropriate level of leadership based on the level of risk involved. The DoD Components have been given the authority to determine these levels of leadership required for risk acceptance.

3.3.1.3. The analyst must provide leadership all the information gathered during the TRA. For ESQD issues, analysts may use the tool in Chapter 5 to calculate some of the information provided to leadership. The analyst and DoD Component process must ensure that the correct leadership are aware of the situation. The analyst must also ensure that the risk assessment TRA portion of the ESRM process was conducted thoroughly, which will provide leadership the most accurate portrayal of the risk (i.e., leadership must not drive the risk to the lowest acceptance level possible). The package presented to leadership must include the controls that could be implemented; these may be presented in a tiered approach to provide leadership options based on fiscal needs.

3.3.1.4. The appropriate risk acceptance authority must acknowledge the documented hazards and risks presented. With all the information provided, a decision is made on a direction

for the organization to proceed and this decision must be documented. The control measures chosen must be fully funded and the residual risk, if any, must then be accepted. If full funding is not provided, then the additional risk must be identified in the first TRA step.

3.3.2. Step 2: Implement Selected Options

3.3.2.1. The second step of the MRA is to implement selected options and leaders are the key to proper implementation. Without active leadership involvement, many options, such as changes in procedures, wearing of personal protective equipment, etc., may not occur. Leaders must provide clear and concise executable orders that are understood and conveyed down to the lowest level of the organization involved or risk management will not be effective. Communication is key to implementation.

3.3.2.2. A schedule must be developed with the specific description of the problems and solutions. The schedule should include a plan of action that has measurable outputs in order to determine the success of the controls. The schedule should also prioritize these outputs with target dates for completion and a point of contact responsible for monitoring or directing the action.

3.3.2.3. The workforce must be informed about the control measures and the reasons selected options are being implemented. They must be trained to carry out the new instructions and changes.

3.3.3. Step 3: Monitor and Evaluate Mitigation Controls

3.3.3.1. The last step of the MRA is to monitor and evaluate the mitigation controls. This step provides the means for validating the selected control measures. Leadership is key in this step as it must ensure employees understand the six questions (who, what, where, when, why, and how) and the employees' relationship to the selected risk mitigation options.

3.3.3.2. The intent of monitoring is to validate that risk management decisions were made and successfully implemented. Monitoring is integral to good leadership. Periodic reviews provide the information used to ensure the risk management decisions work correctly. These reviews should be made against established metrics to ensure consistency in the monitoring stage.

3.3.3.3. A thorough evaluation may identify hazards that were not in the original assessment. Evaluating the risk management decisions selected against established metrics will most likely show a change in the original risk probability. This new risk level must then be reevaluated by entering it into the first step of the TRA, thus closing the loop on the dynamic cyclic ESRM process.

CHAPTER 4

DEVIATIONS AND HYBRID SAFETY SUBMISSIONS (HSS)

4.1. Deviations

4.1.1. In accordance with Reference (a), the term "deviation" refers to the mechanism(s) by which a DoD Component can accept, assess, and document the risk for not complying with or "deviating" from the requirements of Reference (d). Specific deviation mechanisms include waivers, exemptions, and Secretarial exemptions and certifications.

4.1.2. When strict compliance with explosives safety standards could adversely affect the successful outcome of a DoD operation, explosives or chemical agent safety risk must be weighed against strategic or compelling operational requirements. DoD Components apply the tenets of Military Munitions Risk Stewardship to ensure informed risk decisions are made at the appropriate leadership level and hazards, or the risks associated with deviations from explosives safety standards, are appropriately mitigated per DoD Component-specific requirements.

4.2 HSS

4.2.1. HSS address facilities and operations that may not conform to ESQD criteria in Reference (d) or risk-based criteria in DDESB TP 14 (Reference (n)). An HSS is differs from a Risk-Based Safety Submission (RBSS). RBSS are those that do not meet the ESQD criteria of Reference (d), but do meet the DDESB-approved risk-based siting acceptance criteria. An RBSS is evaluated using a quantitative risk assessment tool (i.e. Safety Assessment for Explosives Risk (SAFER)). In contrast, an HSS does not conform to criteria, even using SAFER or an equivalent tool.

4.2.2. A DoD Component must accept the explosives or chemical agent safety risk for the nonconforming part of the HSS. The HSS is forwarded to the DDESB for approval of the conforming portion. The DDESB staff may review and comment on the characterization of the nonconforming portion, but will not take a position on the acceptability of the risk or the approval of the deviation. An HSS may also include a DoD Component's submission of a plan that may not meet established criteria or for which criteria may not exist, but for which the DoD Component wants a DDESB staff technical review. The tool described in Chapter 5 can be used to assist in the assessment of the HSS nonconforming risk.

4.2.3. In the absence of a DoD Component-developed methodology or risk management tool, the following information is necessary when submitting an HSS:

4.2.3.1. A description of the munitions operation.

4.2.3.2. A description of the deviation from Reference (d).

4.2.3.3. A statement of the operational necessity.

4.2.3.4. Projected time period for the deviation.

4.2.3.5. The number of exposed personnel, both related and unrelated.

4.2.3.6. The types and quantities of munitions involved.

4.2.3.7. A description of any buildings (e.g., magazine, operating location, inert storage, etc.) involved.

4.2.3.8. The information provided by the tool described in Chapter 5.

CHAPTER 5

AUTOMATED SAFETY ASSESSMENT PROTOCOL - EXPLOSIVES TOOL

5.1. General

5.1.1. The Automated Safety Assessment Protocol – Explosives (ASAP-X) is a Microsoft Excel spreadsheet designed to assist DoD Component personnel in assessing hazards associated with ESQD noncompliance. There are two versions located on the DDESB Website: http://www.ddesb.pentagon.mil. One is for Microsoft Office 2007 products and the other if for previous versions of Microsoft Office. The DDESB recommends it be included as part of an HSS submission to the DDESB. The ASAP-X can also be used to support deviations involving Explosives Safety Quantity-Distance (ESQD) related risk. The ASAP-X consists of four separate worksheets, the first being version/date control and three others described below.

5.1.2. The three ASAP-X input/output worksheet descriptions:

5.1.2.1. The second ASAP-X worksheet is used for assessing earth-covered magazine (ECM) related explosives safety risks.

5.1.2.2. The third ASAP-X worksheet is used for assessing all other potential explosive site (PES) related explosives safety risks (with the exception of intentional detonation, hardened aircraft shelters, an underground PES, and explosive ordnance disposal (EOD) proficiency ranges).

5.1.2.3. The fourth ASAP-X worksheet is left blank for manual data input and output. It does not perform any automated calculations.

5.1.3. After determining a QD deviation at a single PES exists and a site plan or waiver is necessary, personnel can open the ASAP-X. Appendix A contains screen shots of all the ASAP-X worksheets. The ASAP-X is not designed to assist in assessing such deviations as lightning protection systems or vegetation control. The ASAP-X will only estimate fatalities and building structure loss. It does not estimate the loss of equipment inside the structure or mission loss due to structural damage.

5.1.4. If an IMD related deviation exists, users are reminded the PES hazard division (HD) net explosives weights (NEWs) are the total of all the NEWs at all the PES locations involved in the deviation. An IMD related deviation between two such locations could actually cause additional locations to have IMD related deviations. When addressing IMD related deviations, it is important to accurately identify the explosives or chemical agent hazards and assess all associated risks.

5.2. ASAP-X Instructions

5.2.1. When the ASAP-X spreadsheet is opened, the version/date cover page appears. The user must decide if he/she is working with an ECM or other PES before opening any other worksheet.

5.2.2 If the user decides he/she is working with an ECM, he/she must click on the ECM Worksheet tab and the sheet will appear. On the right, the user will see a sectioned drawing depicting an ECM with six distinct zones. These zones represent, from the innermost to the outermost, explosives blast criteria (K6, K9, K11, and K18), public traffic route distance, and inhabited building distance (IBD). The left section has blank cells for HD NEW input and two questions. There is a section for building cost (exposed site (ES)), distance from the ECM to the ES, and number of personnel at each ES. The user must first enter all the ECM HD NEWs and answer the two questions. The ASAP-X calculates the appropriate zoning criteria and inputs it in the spaces on the right side.

5.2.3. Next, the user must then enter a name for each ES, the number of personnel at the ES, the distance the ES is from the ECM, estimated ES cost, and the relationship of the ES to the ECM. The program calculates which zone the ESs are located in and enters this data in the appropriate data output sections.

5.2.4. If the violation does not pertain to an ECM, the analyst must choose the third worksheet, “All Other PES.” This worksheet functions the same with the exception that there is no PES-ES relationship that must be selected and the two questions are different.

5.2.5. The fourth worksheet is used for manual data input. The analyst must manually calculate the appropriate zone distances (based on the HD NEWs at the PES) and enter the personnel and building data into the correct boxes. This worksheet does not perform any automatic calculations. Personnel fatality and building damage calculations can be found in Appendix A.

5.2.6. The DDESB requires information regarding the specific PES-ES pairs that are in violation of the Reference (d), both before and after the change that caused the violation to occur. The DoD Component must provide this information in support of an HSS.

5.2.6. If a DoD Component would like to determine the total risk for an operation, based on specific criteria from reference (d), in terms of personnel and building damage cost, the user should input personnel and building costs for everything inside the IBD zone and not just the PES-ES pair violation. This can be performed for both the “before” and “after” scenarios. This difference will provide the user with a total delta risk for the situation.

5.2.7. Because the ASAP-X was developed to assist in the risk assessment process, all of this information may be presented to leadership for review with the deviation package. It provides the information in an easily reviewable form, assisting leaders or managers in making a decision on an explosives safety risk.

REFERENCES

(a) DoD Instruction 6055.16, “Explosives Safety Management Program,” July 29, 2008

(b) DoD Directive 6055.9E, “DoD Explosives Safety Management and the DoD Explosives Safety Board,” August 19, 2005

(c) DoD Directive 4715.1E, “Environment, Safety, and Occupational Health (ESOH),” March 19, 2005

(d) DoD 6055.09-STD, “DoD Ammunition and Explosives Safety Standards,” February 29, 2008

(e) Fischhoff, B, S Lichtenstein, P Slovic, SL Derby, RL Keeney, *Acceptable Risk*, Cambridge University Press, UK, 1981.

(f) Office of Management and Budget, “Principles for Risk Analysis,” January 12, 1995

(g) Office of Management and Budget, “Updated Principles for Risk Analysis,” September 19, 2007

(h) Field Manual 5-19, “Composite Risk Management,” August 21, 2006

(i) Department of the Army Pamphlet 385-30, “Mishap Risk Management,” October 10, 2007

(j) OPNAV Instruction 3500.39B, “Operational Risk Management (ORM),” July 30, 2004

(k) Marine Corps Order 3500.27B, “Operational Risk Management (ORM),” May 5, 2004

(l) Air Force Pamphlet 90-902, “Operational Risk Management (ORM) Guidance and Tools,” December 14, 2000

(m) Air Force Manual 91-201, “Explosives Safety Standards,” November 17, 2008

(n) DDESB Technical Paper 14, “Approved Methods and Algorithms for DoD Risk-Based Explosives Siting, Revision 3, February 2007

APPENDIX A
AUTOMATED SAFETY ASSESSMENT PROTOCOL - EXPLOSIVES WORKSHEETS/CALCULATIONS

DDESB
AUTOMATED SAFETY ASSESSMENT PROTOCOL - EXPLOSIVES
VERSION 1.0 - Excel 2007

Based on
DDESB Technical Paper 23,
Assessing Explosives Safety Risks,
Deviations, And Consequences

Sponsored by:
DDESB, Program Evaluation Division

REQUIRED EXCEL SETTINGS

(1) Under "**Print**" menu, select "Active Sheets".

(2) This Spreadsheet will only work for Microsoft Office 2007.

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24 April 2009

ASAP-X COVER PAGE

EARTH COVERED MAGAZINE INPUT			
HAZARD DIVISION	NEW		
1.1		Is the ECM undefined?	
1.2.1			
1.2.1 MCE			
1.2.2		Is the ECM 26 ft x 60 ft or larger?	
1.2.3			
1.2.3 MCE			
1.2.3 HFD (xx)			
1.3			
1.4			

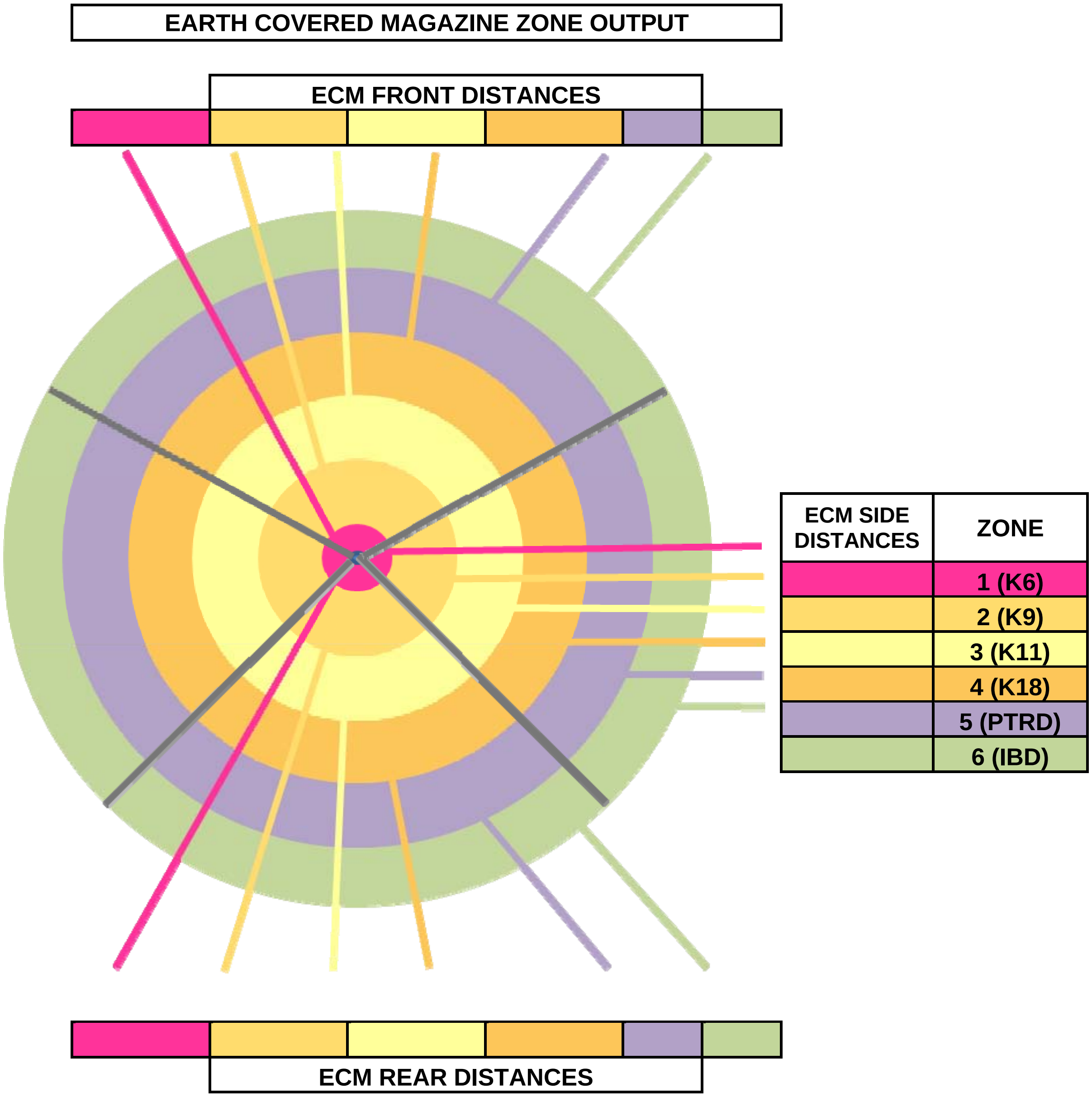
ES INPUT DATA				
ES Name	Dist from PES	Personnel at ES	Bldg Cost	Orientation

ECM INPUT INFORMATION

EARTH COVERED MAGAZINE OUTPUT					
ZONE	DISTANCE	FATAL	BUILDING DAMAGE LOSS	% BLDG DAMAGE	% FATAL
1	1 (K6)				
2	2 (K9)				
3	3 (K11)				
4	4 (K18)				
5	5 (PTRD)				
6	6 (IBD)				

TOTAL PEOPLE AFFECTED	
TOTAL FATALITIES	
% FATALITIES	
TOTAL BUILDING COSTS	
TOTAL BLDG DAMAGE LOSS	
% BUILDING DAMAGE LOSS	
TOTAL ESs AFFECTED	

ECM GROUP OUTPUT INFORMATION



ECM RISK ZONES

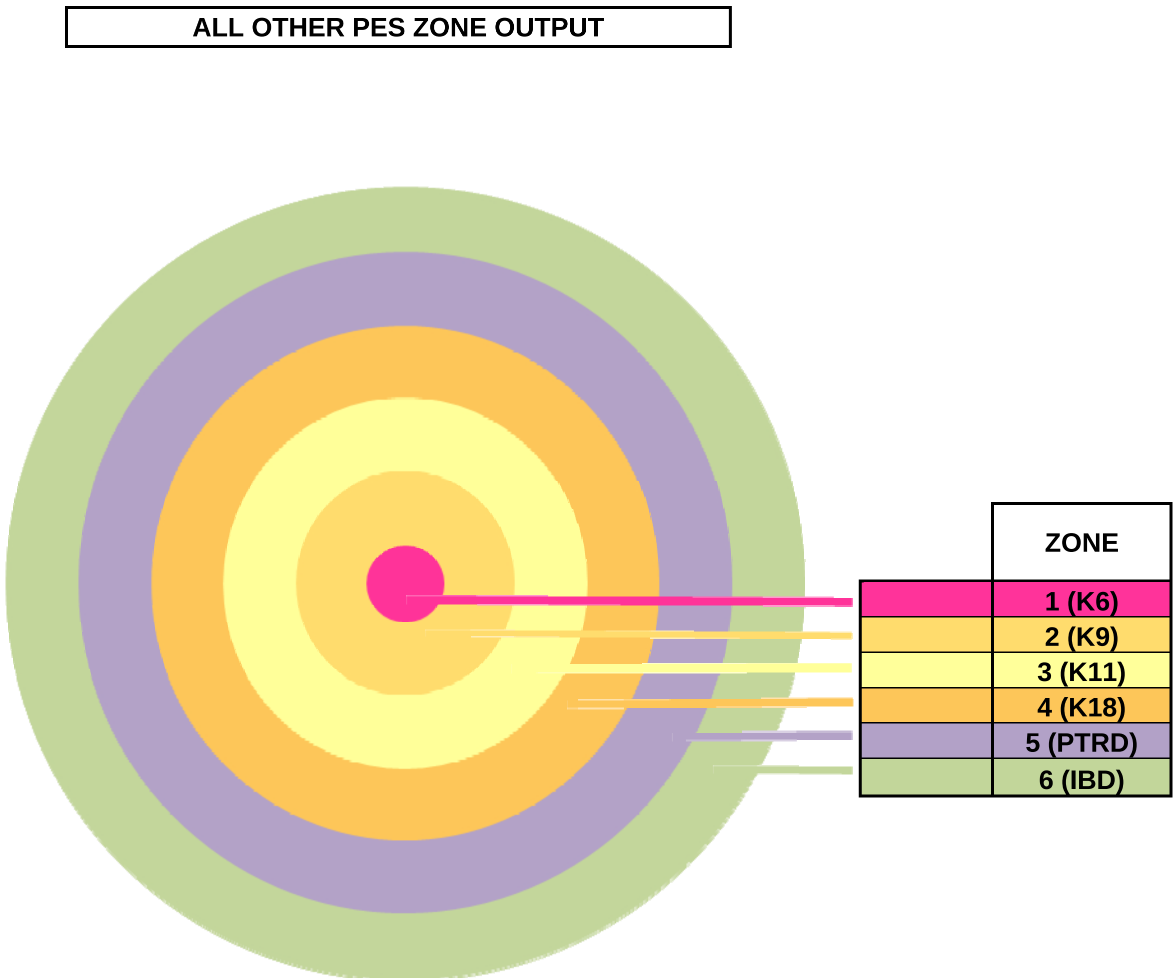
ES OUTPUT DATA						
ES Name	Distance From PES	Zone	Personnel at ES	Fatalities	Building Cost	Building Damage Loss

INDIVIDUAL ES OUTPUT

ALL OTHER PES INPUT			
HAZARD DIVISION	NEW		
1.1		Is the PES an open pad?	
1.2.1			
1.2.1 MCE		If the PES is a structure, is it capable of stopping primary fragments?	
1.2.2			
1.2.3			
1.2.3 MCE			
1.2.3 HFD (xx)			
1.3			
1.4			

ES INPUT DATA			
ES Name	Dist from PES	Personnel at ES	Bldg Cost

ALL OTHER PES INPUT



ALL OTHER PES RISK ZONES

ALL OTHER PES OUTPUT					
ZONE	DISTANCE	FATAL	BUILDING DAMAGE LOSS	% BLDG DAMAGE	% FATAL
1					
2					
3					
4					
5					
6					

TOTAL PEOPLE AFFECTED	
TOTAL FATALITIES	
% FATALITIES	
TOTAL BUILDING COSTS	
TOTAL BLDG DAMAGE LOSS	
% BUILDING DAMAGE LOSS	
TOTAL # OF ESs	

ALL OTHER PES GROUP OUTPUT

GLOSSARY

CRM	Composite Risk Management
DA PAM	Department of the Army Pamphlet
DDESB	Department of Defense Explosives Safety Board
DoD	Department of Defense
DoDI	DoD Instruction
ECM	earth-covered magazine
EOD	explosive ordnance disposal
ES	exposed site
ESM	explosives safety management
ESMP	Explosives Safety Management Program
ESQD	explosives safety quantity-distance
ESRM	Explosives Safety Risk Management
HD	hazard division
HSS	Hybrid Safety Submissions
IBD	inhabited building distance
IMD	intermagazine distance
MRA	Managerial Risk Area
MRM	mishap risk management
NEW	net explosives weight
OMB	Office of Management and Budget
ORM	operational risk management
PES	potential explosive site
QD	quantity distance
RAC	risk assessment code
RBSS	Risk-Based Safety Submission
SAFER	Safety Assessment for Explosives Risk
TP	technical paper
TRA	Technical Risk Area